

CLAIMS

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A lamp monitor for a motor vehicle comprising:
 - 5 a lamp, the lamp having an operating lamp current and a preferred lamp current;
 - a current sensor coupled to the lamp, and producing a current sensor output, the current sensor output indicative of the operating lamp current;
 - a processor for comparing the current sensor output with the preferred lamp current; and
 - 10 a display for indicating if the current sensor output is acceptable.
2. The lamp monitor of claim 1 where the display is coupled to the processor, the display has an indicator, and the indicator is actuated if the operating lamp current is approximately equal to the preferred lamp current.
3. The lamp monitor of claim 1 where the display is coupled to the processor, the
 - 15 display has an indicator, and the indicator is actuated if the operating lamp current is less than the preferred lamp current.
4. The lamp monitor of claim 1 where the display is coupled to the processor, the display has an indicator, and the indicator is actuated if the operating lamp current is more than the preferred lamp current.
- 20 5. The lamp monitor of claim 1 where the processor is coupled to the current sensor.
6. The lamp monitor of claim 5 where the processor includes a memory, and the processor stores a current sensor output value in the memory.

7. The lamp monitor of claim 6 where a preferred lamp current value is stored in the memory.

8. The lamp monitor of claim 7 where the processor compares the preferred lamp current value to the current sensor output value to determine whether the operating lamp current is approximately equal to the preferred lamp current.

9. The lamp monitor of claim 8 where an analog-to-digital converter is coupled to the current sensor.

10. The lamp monitor of claim 9 where the analog-to-digital converter produces the current sense output value.

11. The lamp monitor of claim 9 where the analog-to-digital converter has a digital current sensor output.

12. The lamp monitor of claim 10 where the digital current sensor output is stored in the memory.

13. The lamp monitor of claim 12 where a plurality of digital current sensor outputs are stored in the memory.

14. The lamp monitor of claim 13 where the processor computes the current sensor output value from the plurality of digital current sensor outputs stored in the memory.

15. The lamp monitor of claim 14 where the current sensor output value is an average of the plurality of digital current sensor outputs stored in the memory.

16. The lamp monitor of claim 15 where the current sensor output value is proportional to the average of the plurality of digital current sensor outputs stored in memory.

17. The lamp monitor of claim 16 where the display indicates if the preferred lamp current value is approximately equal to the current sensor output value.

18. The lamp monitor of claim 16 where the display indicates if the preferred lamp current value is more than the current sensor output value.

19. The lamp monitor of claim 16 where the display indicates if the preferred lamp current value is less than the current sensor output value.

5 20. The lamp monitor of claim 16 where the current sensor output value is compared to a minimum lamp current value.

21. The lamp monitor of claim 20 where the minimum lamp current value is a fraction of the preferred lamp current value.

10 22. The lamp monitor of claim 21 where the minimum preferred lamp current value is one-half of the preferred lamp current value.

23. The lamp monitor of claim 22 where the current sensor output value is compared to a maximum lamp current value, the maximum lamp current value being greater than the preferred lamp current value.

15 24. The lamp monitor of claim 23 where the maximum lamp current value is fifty percent greater than the preferred lamp current value.

25. The lamp monitor of claim 24 where the current sensor output value is compared to a operating current range.

26. The lamp monitor of claim 25 where the display indicates if the current sensor output value is within the operating current range.

20 27. The lamp monitor of claim 26 where the operating current range varies from about 50% of the preferred lamp current value to about 150% of the preferred lamp current value.

28. The lamp monitor of claim 27 where the display includes a display lamp, and the display lamp is illuminated if the current sensor output value is within the operating current range.

29. The lamp monitor of claim 28 further comprising:

5 a plurality of lamps, each of the plurality of lamps having a preferred lamp current value, the display including a plurality of status lamps, where each status lamp is associated with one lamp, and where the analog-to-digital converter is selectively coupled to each of the plurality of lamps.

30. The lamp monitor of claim 29 further comprising:

10 a battery for powering the plurality of lamps, the battery having a battery voltage; and

a battery status lamp, integral with the display, which is illuminated if the battery voltage falls below a minimum battery operating voltage or if the battery voltage rises above a maximum operating voltage.

15 31. The lamp monitor of claim 30 where the battery is coupled to the analog-to-digital converter, the minimum battery operating voltage is stored in the memory, and the processor determines if the battery voltage is below the minimum battery operating voltage.

32. A method of operating a lamp monitor, the lamp monitor having a lamp and a status lamp, comprising:

20 calculating an operating current range for the lamp;
determining a lamp current;
comparing the lamp current with the operating current range; and

if the lamp current is within the operating current range, then illuminating the status lamp.

33. The method of claim 32 where the step of determining a lamp current comprises the steps of:

5 sampling a current flowing through the lamp a predetermined number of times;
and

calculating the lamp current based on the sampling.

34. The method of claim 33 where the step of calculating the lamp value based on the sampling comprises calculating an average from the sampling.

10 35. The method of claim 34 where the step of calculating an operating current range for the lamp comprises:

energizing the lamp with an initial lamp current;

taking a plurality of samples of the initial lamp current; and

15 calculating the operating current range from the plurality of samples of lamp
current.

36. The method of claim 35 where the step of calculating the operating current range from the plurality of samples of the initial current comprises averaging the plurality of sample of the lamp current.

20 37. The method of claim 36 where the step of taking a plurality of samples of the lamp current includes converting an analog current signal to a digital current signal.

38. A method of operating a lamp monitor, the lamp monitor having a plurality of lamps and a plurality of status lamps, where each one of the plurality of lamps has a corresponding one of the plurality of status lamps, comprising:

calculating an operating current range for each of the plurality of lamps;
determining a lamp current for each of the plurality of lamps;
for each of the plurality of lamps, comparing the lamp current with the acceptable
operating current range; and

5 for all of the plurality of lamps, if the lamp current for one of the plurality of
lamps is within the operating current range, then illuminating the corresponding one of the
plurality of status lamps.

39. The method of claim 38 where the step of determining a lamp current for each of
the plurality of lamps comprises the steps of:

10 sampling for a predetermined number of times a current flowing through one of
the plurality of lamps; and

calculating the lamp current based on the sampling.

40. The method of claim 39 where the step of calculating the lamp current based on
the sampling comprises calculating an average from the sampling.

15 41. The method of claim 40 where the step of calculating an operating current range
for each of the plurality of lamps comprises:

illuminating a select one of the plurality of lamps with an initial current;

illuminating a select one of the plurality of status lamps corresponding to the
select one of the plurality of lamps ;

20 taking a plurality of samples of the initial current;

calculating a lamp current from the plurality of samples of the initial current;

extinguishing the select one of the plurality of lamps; and

extinguishing the select one of the plurality of status lamps corresponding to one of the plurality of lamps.

42. The method of claim 41 where the step of calculating a lamp current from the plurality of samples of the initial current comprises averaging the plurality of sample of the
5 initial current.

43. The method of claim 42 where the step of taking a plurality of samples of the initial current includes converting an analog initial current signal to a digital initial current signal.

44. The method of claim 43 where the step of illuminating a select one of the plurality
10 of lamps with an initial current comprises illuminating all of the plurality of lamps with a plurality of initial currents.

45. The method of claim 44 where the plurality of lamps and the plurality of status lamps are powered by a battery, the battery having a battery voltage, further comprising:

monitoring the battery voltage; and

15 illuminating a voltage battery status lamp if the battery voltage falls below a predetermined voltage.